

4

OBSERVATIONS
ON
THE NUTRITIVE PROPERTIES
OF
Acacia=Gum,
KNOWN IN COMMERCE UNDER THE NAMES
OF
Gum-Arabic & Gum-Senegal,
AND ON
THE USES TO WHICH IT MAY BE APPLIED
IN
Tropical Climates.

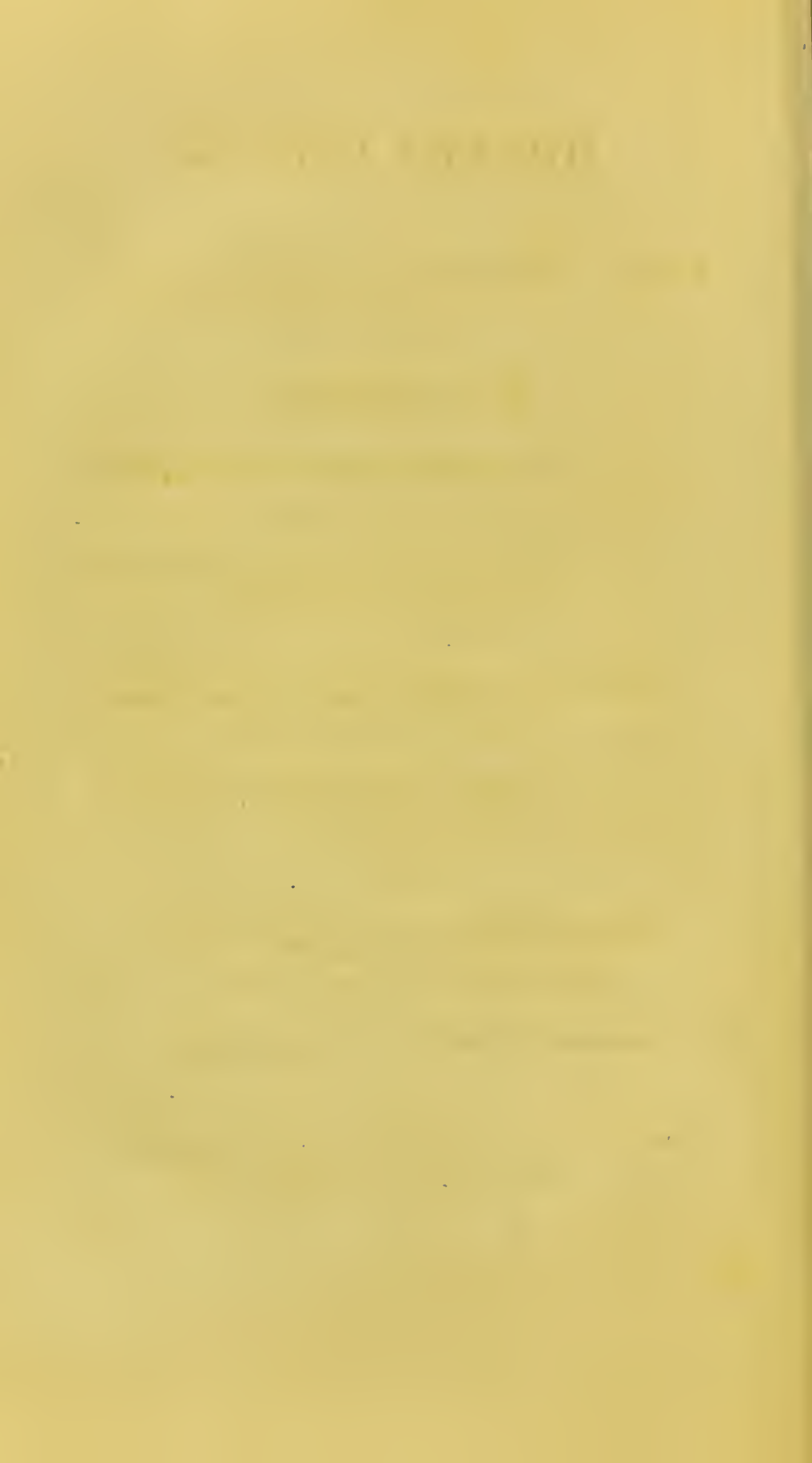


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London,
Printed for T. and G. UNDERWOOD, 32, Fleet-street; and sold by
BALDWIN, CRADOCK, and JOY, Paternoster Row; and
BEILBY and KNOTTS, Birmingham.

1818.



PREFACE.



IN two letters inserted last year in the Gentleman's Magazine, I suggested the use of a Concentrated Alimentary Compound to persons engaged in traversing the interior of Africa. On the present occasion, I have taken a more extended view of this subject, and have further suggested the utility of the same preparation to armies performing marches in tropical climates.

Sutton Coldfield,

June 1, 1818.

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OBSERVATIONS, &c.



THE nutritive properties of Acacia-Gum, sold under the names of Gum-Arabic and Gum-Senegal, were long since made known by two travellers, distinguished for general science, but more especially for botanical science, Hasselquist and Adanson. By the first-mentioned author it is related (English translation of his voyages and travels, 1766) that above one thousand persons, belonging to an Abyssinian caravan, were supported for two months by Gum-Arabic alone; and M. Adanson informs us, that Gum-Senegal (which, like Gum-Arabic, is exuded from an acacia-tree) constitutes the chief, if not the only sustenance of the Moors and Arabs in their long wanderings across the African deserts.* Observations

*Le gommier de Senegal, celui dont le suc fait presque la seule nourriture des Arabes, pendant leurs voyages dans les

of a similar tendency might be produced from various other travellers; but the facts above-stated are so decisive, and rest upon authority so unquestionable, that all other concurrent testimony may be deemed superfluous.

No use, however, of these facts seems to have been made by European travellers. And this is the more surprising, since Dr. Lind has noticed them in the Appendix to his valuable *Treatise on the Diseases of Hot Climates*, a work which has been frequently reprinted.

When the much-lamented result of the expedition to explore the river Zaire, under

deserts de l'Afrique. And in another paragraph, La gomme de cet arbre est si nourissante, si salulaire, si rafraichissante que les Maures et les Arabes en font leur unique nourriture pendant la plus grande partie de l'année, au moins pendant leurs longs voyages, &c. *Memoires de l' Acad. Royale des Sciences de Paris, année 1778.*—The trees, whether different species or merely varieties, which yield Gum-Senegal and Gum-Arabic, belong not to the genus *mimosa* (to which Linnæus, from seeing only dried and damaged specimens had referred them) but as Adanson has shown, to the genus *acacia*.

the direction of the late Captain Tuckey, was first communicated to the public, I was induced to turn my attention to the means by which life, under similar circumstances, might be supported.

Of 30 persons who set out on the *land journey* beyond the cataracts of the above-mentioned river, 14 died (as it appears) from fatigue and exhaustion.* They had calculated on finding a sufficiency of water and food in the line of their march; but the farther they penetrated into the country, the greater was the scarcity of both. Worn down by exertion, parching with thirst, and fainting from hunger, they had to retrace their steps to the banks of the river. It is only surprising that any of them survived.

But if a party similarly circumstanced were provided with some sort of food, in a portable and concentrated form, is it not pro-

* Captain Tuckey's Narrative. Introduction, p. XLIII.

bable that such disastrous consequences might be prevented?

Supposing this to be granted, another question arises, whether the food should be animal or vegetable?

Not animal food, certainly; although, weight for weight, it is more nourishing than vegetable food; because in its freshest and most simple state it requires large dilution, and when prepared for keeping, must have the addition of salt and spices, two substances which never fail to create thirst—an evil so much to be dreaded in a hot climate.

The food, then, with which persons so circumstanced should be provided, should be, not animal, but vegetable food.* But what kind of vegetable food?

* From Captain Tuckey's narrative it appears, that the Congoese subsist wholly on vegetable food (Manioc, Plantains, Yams, Ground Nuts, &c.); for although animal food is sold at

While I was revolving this question in my mind, I recollected some of the facts recorded by the authors before-mentioned, concerning the nutritive properties of *Gum*; and on further consideration I was convinced, that this substance ought to constitute a principal part of the required provision. The object being to combine as much vegetable nutriment in as little bulk as possible, it further appeared, that the next best substance for this purpose would be *Starch*, previously gelatinized by boiling water. The compound to be afterwards evaporated to dryness, that it might be portable and not altered by exposure to the air.

Embomma, yet as this place is the grand mart for conducting the slave trade of the Zaire, Captain T. remarks that these supplies may be chiefly intended for the crews of the European ships. How sufficient vegetable food, and nothing but vegetable food, is for the support of life in the climate of Africa, is evinced by the following fact:—

In 1784, Mons. Saugnier being shipwrecked on the north-west coast of Africa, was plundered and seized as a slave by the Arabs, and compelled to accompany them in a journey through the Great Desert. During one part of the journey he “for nine days ate nothing but small wild fruits, resembling jujubes.” *Leyden’s Africa*, I, 264.

On trial it was found that the Compound thus obtained is hard and brittle; that it may be kept for an indefinite time without spoiling; and that being in a concentrated and portable form, it may be considered (when two other ingredients hereafter-mentioned are combined with it) as the best possible sort of provision for persons undertaking journeys in hot and desert countries.

The Compound in this state is well adapted to appease hunger; but in the arid wastes of Africa the allaying of thirst must also be kept in view. To answer this intention, Citric Acid is added; and lastly, in order to prevent diarrhœa and excessive perspiration;* and the exhaustion which such

* To what an extent the perspiration is forced out by bodily exercise in the climate of Africa, the following passage in Captain Tuckey's Narrative (p. 194) will serve to shew:—
 "Finding it useless to go any further (it was night) we made a fire to dry our cloaks, which were literally soaked with perspiration."

evacuations never fail to induce, another vegetable substance, Catechu, is intermixed with the whole.*

It is proper to remark that when Starch made from wheat-flour is used in preparing the Compound above-described, it must not be the common *blued* starch, which is unfit for internal use, but pure white starch. Arrow-root, sago, or salep, which are all amylaceous substances, would be preferred to wheat-starch, were it not for the difference in price.

In the periodical publication before referred to, I have stated that the best proportions appeared to be two ounces of gum to a pint of starch jelly; but I omitted to mention that it should be a *stiff jelly* prepared with two ounces of the starch to a pint of water, and that it should be well boiled to

* See Gent. Magazine for September, 1817.

give it the proper consistence. The gum previously reduced to powder, is to be mixed with the jelly, and afterwards the pulverized catechu and crystallized citric acid are to be added, half a drachm of the former and one drachm of the latter. The exsiccated compound will thus contain equal quantities of gum and starch. It is of a brown colour, resembling gingerbread.*

Before the acid is mixed with it, the jelly must be emptied out of the iron-pot in which it is boiled, into a glazed earthenware vessel, and the compound must be afterwards spread out and dried upon boards, previously dusted over with starch powder. No metallic plates, not even tin, must be used for this purpose. The exsiccation must be conducted slowly and with

* Specimens prepared with double the above-stated proportions of catechu and citric acid, which are then of a dark brown colour and more palatable, have been preferred by some friends who have tasted each sort. I leave it to be decided by trial which is the best.

a very gentle heat, not exceeding 80 or 90 degrees of Fahrenheit. In a higher temperature the gum becomes intumescent, rendering the compound porous and friable; not to mention that the acid is then liable to be decomposed. In attempting to dry the preparation by baking it in an oven, though of a slow heat, I have frequently had it spoiled. A malt-house floor, of a temperature not exceeding that above-mentioned, would seem to be best adapted to its exsiccation in a large way.

With regard to the manner of using this *Alimentary Compound*, it is intended to be carried in the pockets of the travelling party, and not to be chewed, but to be gradually dissolved in the mouth. In this manner a small *but continual* support will be given, sufficient to prevent exhaustion, and the evils consequent to it. Feeding to satiety is here out of the question. I calculate that 4 ounces of this preparation will sustain life

for 24 hours; consequently 2 lbs. (a very portable quantity) would save an individual from perishing by hunger and thirst, and enable him to prosecute his journey for the space of eight days; by which time he would, in all probability, arrive at a place where supplies of food might be procured. But a person would not be overburthened by 4 lbs. weight, and this quantity would suffice for a fortnight.*

This Alimentary Compound being taken only in small quantities, the stomach will remain nearly empty; a condition by no means so favourable to nutrition as that of distention; but it should be remarked, that the food is of a concentrated kind, and

* If *sea-biscuit* would answer the purpose, there would be no occasion for the above-described more expensive preparation; but sea-biscuit (as has been observed in a former communication on this subject, inserted in the Gentleman's Magazine for 1817) is inferior to this compound in nutritive power, and, after being swallowed, would require to be diluted with water or some other drinkable liquid, to which (by pre-supposition) access could not be had.

taken almost incessantly ; so that *the want of distention will be compensated by the quality of the aliment, and the frequency of its ingestion.* This is seen to be the case in convalescence from acute diseases, and in the feeding of many young animals.*

Indeed full meals should never be indulged in by persons who undertake journeys in tropical climates. Capt. Tuckey, (Narrative, p. 214) represents the Congoese as “extremely abstemious ; a little raw manioc and water, and their pipe, for a day.” By this spare diet they escape those febrile disorders to which full-feeding strangers are liable.

As it has been stated in the beginning of these observations, that life may be supported by gum-arabic alone, the admixture of starch may seem superfluous. We would

* See Gentleman's Magazine for December, 1817,

remark, however, that by this addition a compound is produced possessing a greater degree of alimentary power than an equal weight of gum; besides starch is cheaper than gum, and in that point of view desirable. On the other hand, though life might be sustained for a time by gelatinized and exsiccated starch* alone, yet it cannot be supposed that it would answer this intention so well singly, as in combination with gum; which last substance, while it imparts nutriment, is further beneficial in hot climates by its cooling and lightly astringent properties; shewing in this respect some analogy to the juices of muco-dulcescent fruits.

Let it not be objected that it is a species of *medicated food*, in consequence of the admixture of catechu, for medicinal substances are perpetually swallowed in various

* In chemical language—hydrate of starch.

alimentary preparations in common use. Tea and Coffee are drugs. Beer is a *medicated beverage*, being bittered with hop, which, like all other bitters, is a drug.

Neither is it any objection to catechu, as an ingredient in this preparation that it abounds in tannin; for the quantity of this chemical agent taken in 24 hours by persons using the proposed Alimentary Compound, will be far short of the quantity daily swallowed by thousands of people who are in the habit of taking tea.

The only remaining objection against catechu is its peculiar flavour, which is not generally liked. By a little use, however, the palate becomes reconciled to the taste of this substance, as it does to that of many other substances at first disagreeable.

The fitness of gelatinized starch for the support of life, under circumstances of a

scarcity of food, has been noticed by Dr. Lind in the work before referred to; for jelly prepared from salep is similar to that prepared from wheat-starch. But Dr. Lind proposes it to be used in the semi-fluid form, and mixed with decoction of animal substances. In this state, even supposing it would keep for a sufficient length of time without spoiling, it is by no means adapted to *land expeditions*, as it would require to be put into jars, or other vessels, the conveyance of which would be attended with great, if not insurmountable difficulties. It is, however, a species of food well suited to ships' crews, for whom alone the ingenious author seems to have intended it.

In the event of another expedition to explore the interior of Africa, even if the party (as the intelligent editor of Captain Tuckey's Narrative has suggested) should be furnished with asses and mules for the carriage of themselves and their provisions;

still the proposed *Alimentary Compound* would be desirable, since they could not be certain that their stock of water and *ordinary food* would suffice. In the case of such a caravan, this would be a provision in reserve.

But it is not merely to persons travelling over the deserts of Africa that the above-described *Alimentary Compound* is suited. *It promises to be equally serviceable to armies performing marches in tropical climates.*

During the recent military operations in India, it is related that many of the soldiers dropped down dead on the march; and that hundreds afterwards fell victims to illness, produced by fatigue and exhaustion. There is every reason to believe that the sickness and mortality, occurring under these circumstances, might be prevented, if not wholly, at least in a great degree, by the use of the proposed aliment, distributed

among the men (a few ounces to each) previous to a march. I submit this suggestion to the Army Medical Board.

POSTSCRIPT.



M. Majendie, who is entitled to much praise for his researches into many difficult and obscure parts of the animal economy, tried how long dogs could be kept alive on sugar and water, gum and water, &c. They lived about a month, gradually losing flesh, and some time before death manifested symptoms of disease (*Physiologie*, tom. ii. p. p. 392—394). These experiments, however, only show that the dog, a carnivorous animal, cannot be kept alive by vegetable food beyond a limited time. It is not so with man.

M. Majendie seems to consider it as an undoubted fact, that a dog can be supported

by bread alone for a long time (*chacun sait qu' un chien peut vivre long-temps en ne mangeant que du pain. Physiologie, tom. ii. p. 390*). In most families where dogs are kept, small portions of bread fall to their share every day, but they have generally some refuse animal substance besides. I know of no experiments, and the author just mentioned does not refer to any, which prove that dogs can be kept alive for a longer time on bread and water, than on gum and water. But it is well known that man may be supported for a great length of time by bread and water alone, and this, too, under circumstances the most unfavourable, I mean a state of close imprisonment. We see the fallacy that attaches to analogical conclusions. A dog can digest bones, but a man cannot. A small quantity of alcohol will poison a dog (*Treatise on Physiology before quoted, tom. ii. p. 182*) but the same quantity will not poison a man. Hence M. Majendie's experiments on dogs

do not in the smallest degree invalidate the facts stated in the beginning of this pamphlet, concerning *the nutritive properties of gum, in reference to man*; facts that have been established through a series of ages by whole tribes of the human race, in different parts of the continent of Africa.



THE END.

